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Short communication

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Attack by *Augosoma centaurus* (Coleoptera, Scarabaeidae) adults on rattan palm *Laccosperma secundiflorum* (Arecaceae) in Plateaux Batéké, Gabon

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ABSTRACT

An unusual phenomenon consisting of attacks once every two years by adults of a horned beetle on the rattan palm *Laccosperma secundiflorum* (Arecaceae) (known as ‘French palmier-asperge’) was observed in the Plateaux Batéké (Gabon) over the past decade. Residents reported repeated devastation of rattan palm from May to June, pointing to *Pandanus* beetle as the pest killing many shoots within populations of this palm species, which is used as a non-timber forest product (NTFP) for alimentary purposes. The ecological area of these attacks includes gallery forests and groves surrounding Ossouele village and neighbouring villages across the border in Congo Brazzaville. The insect fed on and destroyed the rattan heart, starting at its tip, leading to the deterioration and death of *L. secundiflorum*. Our observations in 2022 allowed us to identify *Augosoma centaurus* (Coleoptera, Scarabaeidae) as the insect pest devastating this climbing palm, reducing the resource quality and quantity for household consumption and trade. Further studies are needed to increase our understanding of the trophic relationship between the pest and its new adult host/feeding plant.

Mots-clés : Horned beetle, pest, French palmier-asperge, non-timber forest product, edible insect, Gabon.

RÉSUMÉ

Attaques d'*Augosoma centaurus* (Coleoptera, Scarabaeidae) sur le palmier rotin *Laccosperma secundiflorum* dans les Plateaux Batéké, au Gabon

Un phénomène inhabituel d'attaques de *Scarabée rhinocéros* sur le rotin *Laccosperma secundiflorum*, a été observé chaque deux an dans les Plateaux Batéké (Gabon), depuis une décennie. Les habitants rapportent la dévastation récurrente des palmiers rotin, de mai à juin, imputée au Coléoptère de *Pandanus*, tuant beaucoup de pieds au sein des populations de cette espèce de palmier qui est un Produit Forestier Non Ligneux (PFNL) à usage alimentaire. La zone écologique de ces attaques inclut les forêts galerie et bosquets d'Ossouélé et ceux voisins du Congo Brazzaville. L'insecte se nourrit et détruit le cœur du «palmier-asperge» à son extrémité, lequel décline et meurt. Nos prospections de 2022 ont permis de révéler et identifier formellement *Augosoma centaurus* comme responsable des attaques de ce palmier grimpant, réduisant la quantité et qualité de la ressource comestible exploitable pour la consommation domestique et le commerce. Des études supplémentaires sont nécessaires pour mieux comprendre cette nouvelle relation trophique entre le ravageur et sa nouvelle plante hôte nourricière.

Keywords: *Scarabée rhinocéros*, ravageur, palmier-asperge, Produit Forestier Non Ligneux, insecte comestible, Gabon.

INTRODUCTION

Augosoma centaurus Fabricius (Coleoptera: Scarabaeidae), commonly known as the African rhinoceros beetle, and cited as an edible insect, is

widely distributed throughout tropical Africa (Milani, 2021). The adults are major pest on coconut trees (Venard-Combes and Mariau, 1983), and is regularly

reported to occur on *Pandanus* and raffia palms (Muafor et al., 2012). This horned beetle pest has been reported causing damage to *Ananas comosus* (L.) Merr. (Bromeliaceae) in Ivory Coast (Guérout, 1974), and on plantains (Musaceae) in Gabon (Pauly et al., 1988). Since then, no further records have been reported on other adult host/feeding plant species. The present work is a report on a new repetitive behaviour of *A. centaurus* devastating the rattan palm *Laccosperma secundiflorum* (P.Beauv.) Kuntze (Arecaceae) in the Plateaux Batéké area in Gabon. Since 2014, and each two following years, residents claimed attack levels causing rarity of this non-timber forest product (NTFP) for trade, increasing their effort to collect the resource, and inducing loss of income. We were awarned about, asked for details and went to forest for observations. Symptoms were observed but not insects because attacks occurred so long time before our visit. In 2022, our passage corresponded to the occurrence of the phenomenon. In current report, ecology, symptoms and the insect involved are described, and the relate illustrations provided.

MATERIALS AND METHODS

The current communication is a report of a phenomenon involving entomology and ecological considerations. To enable a comprehensive understanding of the case, field observations were combined with a rapid survey among farmers in the village of Ossouele (1°04'51"S; 14°22'19"E). Hypotheses for insect identification and its ecological niche were based on both local people's descriptions and field and laboratory observations. The large grove forest Djogo (1°04'18"S; 14°19'48"E) was surveyed for observations and insect collection.

For the identification process, ten (10) individual adults were collected from the field (on July 27th, 2022), consisting of seven (7) males and three (3) females attacking *L. secundiflorum* early in the morning (from 06: 54 to 08:01 AM). We brought them to the Crop Protection Laboratory of the National Higher Institute of Agronomy and Biotechnology (INSAB), University of Sciences and Technologies of Masuku (USTM/Franceville, Gabon), for further observations and preservation in 70% alcohol in glass vials.

RESULTS AND DISCUSSION

Ecology and symptoms

The attacks of the giant rhinoceros beetle *A. centaurus* are reported to occur on shoots of rattan palms growing in secondary forest (Figure 1a), mainly in relatively young fallow (of five to ten years old), where the climbing palms grow within the tree vegetation dominated by species such as *Musanga cercopioides* R.Br. & Tedlie (Urticaceae), *Macaranga monandra* (L.) Muell. et Arg. (Euphorbiaceae), and

Harungana madagascariensis Lam. ex Poir. (Clusiaceae).

Considering the villagers' knowledge reported here, these attacks occurred in grove and gallery forests surrounding villages in the geographical area of Plateaux Batéké, extending to Congo Brazzaville. In Gabon, our target village was Ossouélé (1°04'51"S; 14°22'19"E), and its related grove forests, named Djogo (1°04'18"S; 14°19'48"E), Ompugá (1°03'02"S; 14°20'33"E), and Lenkaa (1°05'12"S; 14°21'42"E). Similar symptoms and the same insect pest were observed in other Gabonese villages, such as Oss-Kama (1°06'33"S; 13°52'02"E) and Okouya (0°58'58"S; 14°03'26"E), as well as in the Congolese villages Kebiri (1°02'43"S; 14°28'12"E), Okogo (0°52'10"S; 14°29'21"E) and Lebiri (1°11'17"S; 14°34'51"E).

The early symptoms of attacks by *A. centaurus* adults on *L. secundiflorum* include plant wilting and the presence of fibrous holes from the insect's alimentary activities, while a brown resin forms on the underside of old stem injuries. These damages are exclusively caused by adults feeding on the growing points of the rattan (Figure 1, a-f), before the plant reaches the flowering stage. The injury consists of the eating and destruction of the heart or plant cabbage in the apex part. The attacked part can bear one to six adult insects. After lethal damage to the terminal bud, the majorly attacked shoots die, causing a significant reduction in the rattan population.

As a result, people have to search in many places to provide a sufficient product for local trade. Indeed, *L. secundiflorum* is a significant Non-Timber Forest Product (NTFP) (Loubelo, 2012). Local populations have declared the rarity of this NTFP during years of heavy attacks.

Diagnosis

The insect causing attacks on rattan palms is known by local people as an edible horned beetle (Enkorogo b'elaba in Gabonese Teke or Apurí in Congolese Teke). However, the term 'horned beetle' is ambiguous because it is used to refer to both *A. centaurus* and *Oryctes monocerus* (Olivier) (Coleoptera: Scarabaeidae). The residents reported that they had never seen such a phenomenon before the current decade.

Therefore, scientific tools (appropriate systematic keys) were used to clearly identify the incriminated insect. The taxonomic characters of the collected insects are consistent with those of *A. centaurus*. The average mean length of adult insects was 7.47 ± 0.99 cm. Males bear two prominent horns, one on the prothorax and one on the head. The thoracic one is larger with two lateral excrescences at the base and is forward-oriented with a bifid apex. The cephalic horn is shorter, backward-curved, with the distal part bearing a protuberance (Figure 2). These characters distinguish it from any other *Augosoma* species (Rowland, et al., 2012).



Figure 1. Symptoms on rattan palm (a, healthy and attacked rattans in their environment, b, a dried broken shoot, c-d, male and female making injuries, e-f, fresh and old holes)

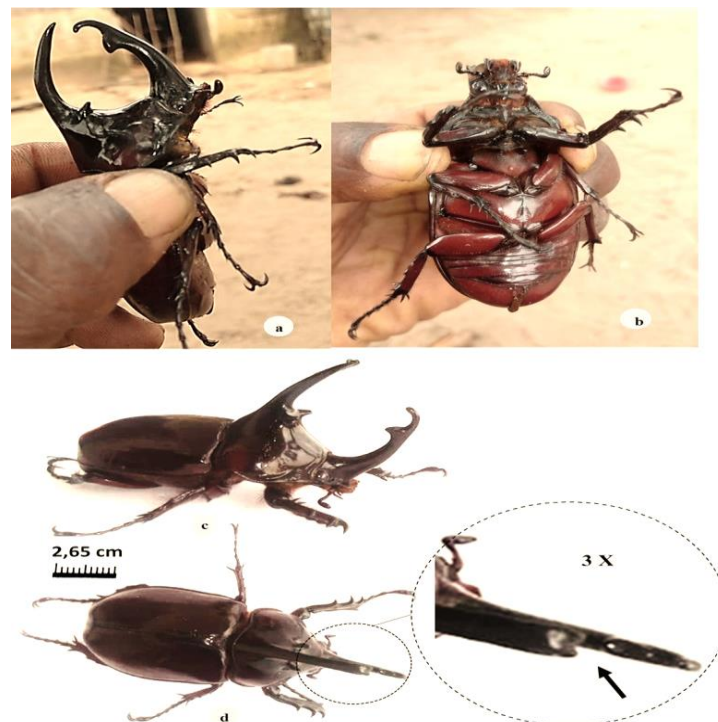


Figure 2. *Augosoma centaurus* (a and b, alive male in lateral and ventral views, c and d, other lateral and dorsal aspects, with a magnified bifid apex of a thoracic horn)

DISCUSSION

Augosoma centaurus is a widely distributed pest in tropical Africa (Milani, 2021), with reported attacks by adult beetles on cultivated crops such as coconut (Venard-Combes and Mariau, 1983), pineapple (Guérout, 1974), and plantain (Pauly et al., 1988). Its wild feeding plants include *Pandanus* and *Raphia*, both plants of swamp forest environments (Muafor et al., 2012). In addition to these plants, we add

Laccosperma secundiflorum as a new species, enlarging the list of the insect's known feeding plants.

The present report highlights for the first time the identity of a serious pest of this plant. The beetle's feeding damage can reduce the production of the edible part of this significant NTFP (Loubelo, 2012) for household consumption and trade, leading communities to exert more effort in collecting a sufficient amount of product. The heavy attacks

seemed to correspond to years of outbreaks of the insect. The field investigation allowed us to observe one to three insects per shoot, but residents usually counted between one and six individuals sharing the same attacked part of plant. The attacks occur once every two years, as frequently reported in the literature (Guérout, 1974; Dendi et al., 2022). Following verbal report from an Nguouoni palm plantation manager, there was an outbreak of horned beetles without attacks on oil palms in May 2022. Within the monocotyledons attacked, it is clearly evident that the adult insects feed mainly on palm hearts and succulent parts of plants. However, it is known that the insect lifecycle begins when adult females lay eggs on dead palm trunks, from which grubs (larvae) hatch and fully develop into the pupa stage (Guérout, 1974). Symptoms on the rattan palm are likely similar to those reported on palm trees (Hill, 2007).

During our field investigation at Ossouele, villagers reported observing the development of edible larvae of this insect on dried and buried roots of dead and rotting individuals of *Peterslanthus macrocarpus* (P. Beauv.) Liben (Lecythidaceae) (called Ombii in Teke). Some residents stated that the dead and decaying trunks of *Ricinodendron heudelotii* (Baill.) Pierre (Euphorbiaceae) (called Osongo in Teke) acted as another substratum for larval development. Some of these trees had been killed by fires used to burn dried vegetation which had been cut for new forest-derived fields. It can be considered that *A. centaurus* has a new host plant allowing the insect (adults) to complete its life cycle. This change in adaptive behaviour could have caused this trophic evolution. Despite its status as a pest, this occurrence provides appreciated edible grubs, confirming the role of this insect as part of the diet of sub-Saharan rural people (Muafor et al., 2014; Detilleux et al., 2021). Indeed, species of Coleoptera (Detilleux et al., 2021) as well as Lepidoptera are the predominant edible insects in this Central African region (Mabossy-Mobouna et al., 2022; Monzenga et al., 2022). Further studies need to be carried out to enhance the understanding of this new ecological phenomenon.

CONCLUSION

The current work aims to understand and report a new *insect-plant* phenomenon occurring in the Plateaux Batéké region in Gabon. Field investigations have allowed the observation of attacks by an African giant horned beetle on Palmier-asperge (*Laccosperma secundiflorum*), an alimentary Non-Timber Forest Product (NTFP). The damage consists of wilting and deterioration of the climbing palm, reducing the availability of this edible resource. The attacks occur every two years within young fallow in grove forests. Laboratory examinations helped formally identify the implicated insect as *Augosoma centaurus*, known as a coconut pest and a local edible insect. These findings highlight a new ecological trophic relationship and provide an enlargement of the list of feeding plants for

this insect's lifecycle. Further studies are needed to determine the pest species strain and ecological parameters inducing these severe attacks, as well as the evolution of the pest's feeding plant range.

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Conflict of interest

The authors declare no conflict of interest.

REFERENCES

- Dendi, D., Ajong, S. N., Eniang, E. A., Segniagbeto, G. H., Assou, D., Ketoh, G. K. K., Gomina, M., Radji, R. A., Simon, G. S., Benansio, J. S., Muscarella, C., Di Vittorio, M., Fa, Julia, Amori, G., & Luiselli, L. (2022). Microhabitat use and seasonality of the sexually dimorphic West African centaurus beetle *Augosoma centaurus*. *Entomological Science*, 25(1). <https://doi.org/10.1111/ens.12494>
- Detilleux, L., Poligui, R. N., Iannello, L., Dogot, T., Francis, F., & Megido Rudy, C. (2021). Entomophagy in Gabon across the African context. *Journal of Insects as Food and Feed*, 8(7):711-720. <https://doi.org/10.3920/JIFF2021.0064>
- Guérout, R. (1974). Attaques d'*Augosoma centaurus* (Coléoptère Scarabeidae) en plantation d'ananas. *Fruits* 29, 609-611. <https://revues.cirad.fr/index.php/fruits>
- Hill, D.S. (2007). *Pests of Crops in Warmer Climates and Their Control*. Springer, United Kingdom, 679p. <https://doi.org/10.1007/978-1-4020-6738-9>
- Loubeo, E. (2012). Impact des produits forestiers non ligneux (PFNL) sur l'économie des ménages et la sécurité alimentaire: cas de la République du Congo. *Economies et finances*. Université Rennes 2, Français. 231 pp. <https://theses.hal.science/tel-00713758>
- Mabossy-Mobouna, G., Ombeni, J. B., Bouyer, T., Latham, P., Bisaux, F., Bocquet, E., Brinck B., Konda Ku Mbuta A., Madamo-Malasi F., Nkulu Ngoie L., Tabi Ekebil, P. P., & Malaisse, F. Diversity of edible caterpillars and their host plants in the Republic of the Congo. (2022). *African Journal of Tropical Entomology Research*, 1(1):3-27. <https://www.ajol.info/index.php/ajter/article/view/228071>
- Milani, L. (2021). Note sul genere *Golofa* Hope (Coleoptera, Scarabeidae, Dynastinae, Dynastini) con descrizione di una nuova specie dal Perù. *Giornale Italiano di Entomologia* 16: 13-24. <https://www.researchgate.net/publication/354322428>

- Monzenga, J-C., Bolondo, G., Looli Boyombe, L., Le Goff, G., & Hance T., (2022). Palm weevils, *Rhynchophorus* sp. (Coleoptera: Dryophthoridae): species inventory and population dynamics in the Kisangani region of DR Congo. *African Journal of Tropical Entomology Research*, 1(1):28-33. <https://www.ajol.info/index.php/ajter/article/view/228072>
- Muafor, F.J., Le Gall, P., & Levang, P. (2012). Contribution of *Augosoma centaurus* Beetle to Rural Livelihoods in the East Region of Cameroon: Study Report. CIFOR, Bogor. 28pp. <https://doi.org/10.1155/2014/214071>
- Muafor, F. J., Levang, P., & Le Gall, P. (2014). A crispy delicacy: *Augosoma* beetle as alternative source of protein in East Cameroon. *International Journal of Biodiversity*, 2014, 1–7. <https://doi.org/10.1155/2014/214071>
- Pauly, A., Rambaldi, G., & De Angelis D., 1988. Guide des principaux ravageurs, maladie et carence des arbres fruitiers au Gabon. FAO, MAEER, Gabon, 133 p.
- https://infodoc.agroparistech.fr/index.php?lvl=notice_display&id=184074
- Rowland, J. M., & Miller, K. B. (2012). Phylogeny and systematics of the giant rhinoceros beetles (Scarabaeidae: Dynastini)". *Insecta Mundi*. Paper 770. <http://digitalcommons.unl.edu/insectamundi/770>
- Venard-Combes, P., & Mariau, D. (1983). *Augosoma centaurus*, Fabricius (Coleoptera Scarabeidae), important ravageur du cocotier en Afrique: Descriptions, biologie, méthode de lutte. *Oléagineux* 38: 651–657. https://horizon.documentation.ird.fr/exl-doc/pleins_textes/pleins_textes_5/b_fdi_30-30/32227.pdf
- Verner, D., Roos, N., Halloran, A., Surabian, G., Tebaldi, E., Ashwill, M., Vellani, S., & Konishi, Y. (2021). Insect and hydroponic farming in Africa, the new circular food economy. International Bank for Reconstruction and Development / The World Bank 1818 H Street NW, Washington, DC 20433. 283pp. <https://doi.org/10.1596/978-1-4648-1766-3>

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